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# Ethics and the choice of animal advocacy campaigns

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## ABSTRACT

This paper examines how different ethical positions view various types of animal advocacy campaigns concerning a product made using animals as an input. The ethical positions represent common company, society, and animal advocate viewpoints. We adopt an industrial economics approach, modelling a market with a monopolistic supplier and subject to consumer-oriented, technological, collaborative, and direct action campaigns. We determine whether the ethical positions support or oppose each campaign, and in what conditions. We find that animal welfare and rights goals are simultaneously satisfied by three campaigns: negotiation, targeted direct action, and awareness raising that condemns low welfare standards.

Keywords: campaigns; ethics; animal rights; animal welfare; welfare.

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## 1. Introduction

Groups advocating animal welfare or rights often try to alter how animals are used in the production of goods and services including food (Compassion in World Farming, 2014), clothing (Coalition to Abolish the Fur Trade, 2014), and entertainment (League against Cruel Sports, 2014). The campaigns available for advocacy groups are many, as they can act on demand, supply, or regulation of those products. For example, the Vegan Society urges people to avoid animal products entirely, while the Animal Liberation Front engages in direct action against producers and suppliers, and Animal Defenders International presses governments to introduce bans on animal use.

There are also many different ethical positions for evaluating such campaigns. Clearly, there are differences between the interests of the advocacy groups and producers, but there can also be clashes with consumer and society viewpoints. Among animal advocates as well there can be disagreements about objectives, with some groups such as the Royal Society for the Prevention of Cruelty to Animals (RSPCA) and Compassion in World Farming (CIWF) primarily pursuing welfare reforms rather than abolition of animal use and others such as People for the Ethical Treatment of Animals (PETA) and the Animal Liberation Front working towards full abolition. Even if animal advocates agree on long term goals, disagreements among animal advocates often extend to the campaign methods they employ, such as whether pressing for short term animal welfare gains is consistent with long term abolition of animal use (Francione, 1996; Singer, 2008; FARM, 2013).

The questions addressed in this paper are as follows. How do markets respond to different animal advocacy campaigns? How do different ethical positions view each

type of campaign? What campaigns attract broad support while allowing advocates to work towards their objectives, and when are disagreements most acute?

We answer these questions through several modelling steps. We start by representing six ethical positions in terms of which quantity or quantities they use to evaluate outcomes in a market for a good that uses animals in production. The ethical positions represent common company, society, and animal advocate viewpoints. Next, algebraic expressions for the ethically relevant quantities are derived in terms of market inputs. Then seven campaigns are characterised in terms of what inputs they change, and the value attached to each campaign by each ethical position is calculated by differentiation or discrete differencing of the ethically relevant quantities with respect to the campaign inputs. The campaigns are either consumer oriented, technologically oriented, collaborative with companies, or direct action.

Our study helps animal advocates in providing clarity on the effect of their campaigns, and guidance in their choices. For advocates motivated by animal rights aims, we find campaigns that work towards these aims while also achieving improvements in welfare, and the design and conditions required to achieve the goals simultaneously. In doing so, we address the concerns of abolitionist animal rights writers including Dunayer (2004) and Francione (1996) that some welfare enhancing reforms can offer no gains for animal rights, or even hinder them.

There are some papers that have anticipated our economic analysis of human use of animals. Blackorby and Donaldson (1992) employ models based on optimisation of combined human and animal utility functions to address welfare and use of research

and food animals. Bennett (1995) adopts marginal value analysis to discuss efficient consumption of livestock products when welfare is taken into account, and its private and public implications. Frank (2006) examines changes in a consumer's utility when information is disclosed about animal welfare. We depart from these authors in our extended comparison of the effect of different campaigns from various ethical perspectives.

Section two describes common ethical positions on animal use, section three describes and solves the model, section four looks at how campaigns are assessed by each ethical position, and section five concludes.

## **2. Ethical positions on animal use**

In this section we present six ethical positions on the merits of animal advocacy campaigns. We take ethics to mean the principles used in determining whether actions should be taken, when those principles describe whose interests are given importance and in what form. The first two ethical positions relate to standard economic assumptions about the behaviour of companies (which we term “company interests”) and consumers (“consumer interests”), and the third allows for general public concerns about animal welfare (“public concern”). The fourth ethical position takes animal welfare as the basis for its ethics (“animal welfare”), while the fifth (“logic of the larder”) takes a modified welfarist position which asserts bringing animals into existence is beneficial. The final position uses animal rights as a foundation for its judgement (“animal rights”).

### *Company interests*

A default assumption in economics on the operation of businesses is that they operate only to maximise profits. Our first ethical position is an amoral one (with respect to animal welfare) that justifies such behaviour. Its only criterion for supporting or opposing a campaign for changing animal use by companies is whether profits are increased by it. Animal welfare and rights are irrelevant. As globally the majority of farm animals are raised for commercial gain, profit maximisation is arguably the main motivation behind animal rearing.

### *Consumer interests*

Economic modelling of markets commonly assumes that consumers maximise their own welfare (or utility) in choosing to buy a good or not. Our second ethical position justifies the behaviour, and evaluates the merits of a campaign solely in terms of whether consumer utility is increased. The position is not inconsistent with concern about animal welfare, as consumers may consider it when they are making their decisions. When consumers allow for animal welfare in making their decisions, they may trade-off animal welfare against other preferences such as taste or social conformity. For example, Frank (2006) presents a model in which animal discomfort reduces human utility and can be offset by utility derived from consumption, while Bennett (1995) finds conditions for optimal consumer choices under different welfare valuations. However, the role of actual welfare levels in influencing their decisions is diminished by the high rates of consumer uncertainty and misperception (Labelling Matters, 2014). In section 3.1, we discuss how these factors alter our results.

### *Animal welfare*

Our next ethical position assesses campaigns in terms of their effect on animal welfare alone. The position may be supported by welfarists who see welfare as the main objective of reform, or by animal right advocates who see welfare reforms as an intermediate or more achievable outcome. Midgley (2008) presents a welfarist position, arguing that society accepts the death of food animals, but not the welfare consequences of intensive farming. She says that humanitarians and farmers can work together for welfare gains. Similar welfarist calls for reform and inclusion of ethical concerns in animal use are made in Fraser (1999) and Rollin (1990). Singer (2008) starts from a rights position, but argues that even if abandonment of animal use in agriculture is an advocate's aim, they should support welfare improvements as abandonment will happen very slowly. The animal welfare position has a strong influence on applied animal advocacy, through the work of welfarist groups such as the RSPCA and groups with ultimate animal rights aims such as PETA.

### *Public concern*

The next ethical position we describe is one in which campaigns are evaluated in terms of their effect on buyer utility, and additionally on separate animal welfare. Thus, there is the potential for the campaign's effect on animal welfare to be considered twice, once in the buyer's utility function (if welfare enters it) and again by direct evaluation. There are a number of reasons why such an ethical position might be influential. As Cowen (2006) and Fearing and Matheny (2007) note, an externality arises as animal lovers suffer disutility from the poor treatment of animals in a market transaction in which they do not participate. Thus, products in which animals are badly treated are typically underpriced under a conventional externality

argument, and an ethical position which allows for animal welfare twice may reflect social preferences more closely than market pricing. Such externalities, as well as other causes including insufficient consumer information, a sense that individual behaviour has no aggregate effect, or inertia, may result in a gap between the preferences of citizens and what they can achieve through individual purchases. The social preferences may become institutionally recognised or enforced by government, who may moreover choose to recognise animal welfare as an explicit social good independently of buyer preferences. Blackorby and Donaldson (1992) specify social value functions in which human and animal utilities are combined.

### *Logic of the larder*

The ethical position termed the “logic of the larder” (Salt, 1914) proposes that animals derive a benefit from living, independently of any happiness or pain experienced during life. So animals can enjoy a positive benefit from being created for production purposes even if their lives are miserable. The idea has long provenance, with Salt (1914) criticising versions of the position proposed in the 19<sup>th</sup> Century. Recent economic models have allowed for the possibility of animals deriving positive value from existence, among alternative positions. The models then consider animals would be better not being born if the sum of their happiness from existence and welfare after birth is negative. In Cowen (2006), humans can choose a minimal standard of animal welfare after birth, below which the animals’ lives are considered not worth living. Blackorby and Donaldson (1992) present a formal mathematical model where minimum lifetime welfare thresholds can be specified for animals and humans. Farm Animal Welfare Council (2009) recognises that life may have intrinsic worth to the animal, but note disagreements about how existence should be valued.



They instead adopt a welfarist position, basing their assessment of animal use on lifetime welfare components. Relative to a logic of the larder position, their viewpoint puts higher demands on acceptable welfare standards and may recommend euthanising an animal with low quality of life when the logic of the larder would not.

### *Animal rights*

Our sixth ethical position evaluates campaigns in terms of the extent of animal use in production. If a campaign reduces the extent of animal use, it is viewed favourably. Regan (1986) and Francione (1996) both propose that no matter how well animals are treated, animals should not be used as resources for human purposes. Regan (1986) asserts that animals have a right to respect for their independent value as distinct from their value to others. Francione (1996) claims that animals have the right not to be treated as property by humans. He argues that advocacy should take the form of pushes for prohibition of aspects of animals' property status, while avoiding reinforcement of other aspects of that status when doing so. We recognise that animal use as a measure of animal rights does not allow for advances through legal protection, but as the core of our working model is a market rather than legislative process, the measure describes the part of animal rights gains possible within this model alone.

## **3. Model**

In this section we present our model of a market for a product which uses animals in production. It consists of a monopolist company selling to a representative consumer who may have preferences about the welfare of animals used. The monopolist is aware of the consumer's demand function, and sets welfare and price to maximise profits. Our broad approach of supply and demand specification, with solution and

demonstration of influences on the equilibrium, is standard in the industrial economics literature (Belleflamme and Peitz, 2010; Martin, 2004). Our introduction of animal welfare as a separate variable distinguishes us from the main body of the literature. The separation of the welfare setting decision from the pricing decision is also made in Ahmadi et al (2011), where only the welfare decision is analysed and price is taken as exogenous. In van der Made and Schoonbeek's (2009) analysis of pollution, companies select price but are distinguished by their exogenous polluting technology, while in Cremer and Thisse (1999) companies choose both polluting technology and price.

We solve the model for profits, consumer utility, animal welfare, and numbers of animals killed. Changes in these quantities determine how campaigns are viewed in each of the ethical positions described in section two. In section four we consider how various campaigns alter the quantities. The definitions of variables used are summarised in the appendix. Full derivations of the mathematical results are given in a working paper<sup>1</sup>.

### *3.1 Specification*

A profit maximising company produces a good using animals and other inputs. The company is assumed to face no competitors (analysis of a competitive market is discussed in the conclusion). Each unit of the good produced is associated with the death of one animal in production (the nature of the results is not sensitive to the number of animals killed and the assumption makes for clearer algebra).

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<sup>1</sup> [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2516855](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2516855)

Each unit of the good is produced at a cost attributable to two components. The first component relates to how well the animals are treated in production, and rises in proportion to the square of their welfare. The quadratic relation can be rationalised by noting that cost-minimising companies will adopt the cheapest ways of raising welfare when they can. As welfare standards rise, the marginal cost of improving welfare by the same amount will usually rise, and if the marginal cost rises linearly the total cost will be quadratic. As an alternative assumption, we could assume that the marginal cost is constant, so that the total welfare cost is linearly increasing with welfare. In our model, this assumption leads to the equilibrium welfare jumping from zero to a high level as the model parameters change, meaning that some of our differential calculus would have to be altered. Otherwise, the analysis would proceed as shown here.

Welfare is measured by a single scalar quantity  $w$ . Animal welfare has multiple dimensions and interpretation (Broom, 1991), and some of the dimensions are not readily comparable or may be unrelated (Hubbard and Scott, 2011; Ingemann et al, 2009). However, we translate from humans to animals the standard economic practice in using a scalar measure to evaluate welfare, thereby following Blackorby and Donaldson (1992).

The second component of cost relates to all other inputs of production and is a constant value  $a$ . Thus, total costs are

$$q(a + bw^2) \tag{1}$$

where  $q$  is quantity sold and  $b$  is a constant.

A representative consumer derives utility from consuming the good, subject to declining marginal utility described by a quadratic curve. They derive increased utility from better animal welfare when the good is produced, with constant marginal utility. The consumer also gets a constant marginal utility normalised at one from consumption of a basket of other goods, whose quantity is measured by  $G$ . Thus, their utility  $U$  is given by

$$U = cq - \frac{1}{2}dq^2 + ewq + G \quad (2)$$

for constants  $c$ ,  $d$ , and  $e$ . We assume that  $c > a$ , so that the consumer derives net utility from consuming at least some of the good in the absence of any welfare considerations.

The form of the utility function could be adjusted to reflect other consumer preferences. For example, if we assume that consumers have the same valuation of an extra unit of the good no matter how much they consume, then the utility function is linear in the quantity consumed, leading to jumps in consumer demand as parameters change. The procedure leads to boundary solutions, where the consumer is spending none or all of their income on the good.

Representative consumer models are standard in the industrial economics literature (Belleflamme and Peitz, 2010, chapter 5), and have been used to calculate jointly price and endogenous pollution levels in an industry (Stathopoulou, 2014). However,

we also experimented with various specifications with consumer heterogeneity, rather than a representative consumer model. One specification followed van der Made and Schoonbeek's (2009) model of pollution valuation, having heterogeneity only in consumer valuation of the merits of welfare. This specification resulted in companies choosing to have either the minimum or maximum possible welfare levels, which did not give informative results when we calculated marginal effects of campaigns. Another specification had heterogeneity in valuation both of welfare and the other features of the good. The company optimisation did not lead to compact algebraic solutions as given in the main part of this paper. We prefer here to work with explicit solutions rather than opt for numerical analysis.

The representative consumer has a budget of  $M$ , a constant. The price of the good is  $p$  and the price of the basket of other goods is normalised at one, so that the budget constraint is

$$M = pq + G. \tag{3}$$

We do not include uncertainty in our model. Actual consumers often are uncertain about the level of welfare in food production, or misperceive it (Labelling Matters, 2014). In the case of misperception, we can continue to solve our model to find market outcomes, but using alternative parameters. However, companies and campaigners may receive less response to some of their actions than is described here, and may in some circumstances find it optimal to keep consumers misinformed. In the case of uncertainty, consumers may act to maximise their expected utility, and we could model their responses as probability weighted averages of behaviour in the

absence of uncertainty. Some consumers may be very adverse to the risk of low welfare, and avoid a good entirely.

### 3.2 Solution

We first solve for the representative consumer's demand for the good at any price  $p$  and welfare  $w$ . The consumer's utility  $U$  in equation 2 given the budget constraint in equation 3 is

$$cq - \frac{1}{2}dq^2 + ewq + M - pq. \quad (4)$$

Differentiating with respect to  $q$ , setting the result equal to zero, and solving for  $q$  gives

$$q = (c + ew - p) / d.$$

The company earns a net income per unit sold of

$$p - a - bw^2.$$

Its profits  $\Pi$  when price is  $p$  and welfare is  $w$  are given by (up to a scaling constant to allow for population size)

$$\Pi = (p - a - bw^2)(c + ew - p) / d. \quad (5)$$

We change variables from  $p$  to  $x$  under the substitution  $p = ew - x$ . The profits are then

$$(ew - x - a - bw^2)(c + x)/d$$

or

$$(-x - b(w - \frac{e}{2b})^2 + \frac{e^2}{4b} - a)(c + x)/d.$$

Since the second bracket is the quantity sold, it is positive and the expression is

minimised when  $w = \frac{e}{2b}$ . Profits are then

$$(-x + \frac{e^2}{4b} - a)(c + x)/d$$

or

$$(-(x - (\frac{e^2}{8b} - \frac{a}{2} - \frac{c}{2}))^2 + (\frac{e^2}{8b} - \frac{a}{2} - \frac{c}{2})^2 + \frac{ce^2}{4b} - ac)/d.$$

The optimum is obtained at

$$x = \frac{e^2}{8b} - \frac{a}{2} - \frac{c}{2}$$

when

$$p = \frac{3e^2 + 4b(a + c)}{8b}.$$

At the solved values of  $p$  and  $w$ , profits are given by

$$\Pi = \frac{(e^2 + 4b(c - a))^2}{64b^2d}.$$

As described in section two, changes in profits are the basis of evaluating advocacy campaigns in the ethical position we term company interests.

Consumer utility is given by

$$U = M + \frac{(e^2 + 4b(c - a))^2}{128b^2d}.$$

Total consumer utility and average per person utility are both maximised together as the population size is not endogenous in the system, and we can consider only per person utility  $U$  in determining utility changes. Changes in utility are how campaigns are evaluated in the ethical position termed consumer interests.

Welfare is given by

$$w = \frac{e}{2b}$$



Changes in welfare are how campaigns are evaluated in the ethical position described here as animal welfare.

The sum of utility and animal welfare is

$$U + w = M + \frac{(e^2 + 4b(c - a))^2}{128b^2d} + \frac{e}{2b}.$$

Changes in this quantity are how we evaluate advocacy campaigns in the ethical position termed here as public concern. The main variable of concern is constructed by direct addition of utility and welfare, and alternative combinations of the two could be made in an unlimited number of ways. Direct addition has the advantages of being a simple and intuitively reasonable representation of how people or society may combine them (in the absence of any detailed econometric evidence) and leading to relatively transparent results without incursion from superfluous parameters.

The number of animals killed is

$$q = \frac{e^2 + 4b(c - a)}{8bd}. \quad (6)$$

Changes in the number of animals killed are taken as the basis for evaluating campaign performance in the ethical position we term animal rights. The idea of selecting this quantity as the basis of evaluation is that among the variables in our

model it best measures the extent to which the right not to be used in production is violated.

The total aggregated welfare is given by

$$wq = \frac{e(e^2 + 4b(c - a))}{16b^2d}.$$

Changes in this quantity form the basis of evaluating campaigns in the ethical position termed here the logic of the larder. The idea is to reflect the position's idea that additional animal life is good, separately from the welfare in which those animals live their lives. Total welfare gives one possible combination of quantity and quality of animal life. There are other ways for a "logic of the larder" position to evaluate campaigns. For example, a positive constant could be added to welfare per animal which would represent the additional value that the position attaches to the creation of an animal. The measure used here offers a plausible representation of the position and is parametrically parsimonious.

We now have algebraic expressions for several variables that are relevant to the ethical positions described in section two. These ethically relevant variables are profits ( $\Pi$ , for company interests), utility ( $U$ , for consumer interests), welfare ( $w$ , for animal welfare), the sum of utility and social welfare ( $U + w$ , for public concern), the quantity of animals killed ( $q$ , for animal rights), and total aggregated welfare ( $wq$ , for the logic of the larder).

## 4. Campaigns

In this section, we consider seven types of campaigns that have been adopted by animal advocacy groups. Two of the campaigns are consumer oriented (raising consumer awareness, and boycott), one is technological (facilitating the introduction of new welfare-enhancing technology), two are collaborative (negotiation on welfare practices, and praise of reforming companies), and two are direct action (targeted direct action against low welfare standards, and general direct action). Our goal is to see how these campaigns affect quantities of interest to each ethical position. The ethical positions were described in section two, and the ethically relevant quantities were derived in algebraic form in section three. The approach adopted is to characterise campaigns as changing input variables to the market model in section three, and then differentiate or finite difference the ethically relevant quantities with respect to these variables. The sign and magnitude of the derivative or difference then show how campaigns are evaluated within and between ethical positions.

### 4.1 Consumer awareness

Advocacy groups have often tried to raise consumer awareness about the welfare of animals used in production processes. Some campaigns have given information about standard practices in animal use (Compassion in World Farming, 2007; Compassion in World Farming, 2010; Pig-vision, 2014), while others detail abuses committed in them (Mercy for Animals, 2014). We consider a campaign type that increases the awareness of consumers of animal welfare standards in production processes. We model its effect as an increase in the parameter  $e$  in the consumer utility function, which represents the valuation of welfare. We can see the effect of the campaign by differentiation of profits  $\Pi$  with respect to  $e$ , which gives

$$\frac{d\Pi}{de} = \frac{e(e^2 + 4b(c - a))}{16b^2d}$$

Differentiation of utility per person  $U$  with respect to  $e$  gives

$$\frac{dU}{de} = \frac{e(e^2 + 4b(c - a))}{32b^2d}.$$

When welfare per animal  $w$  is differentiated with respect to  $e$ , the result is

$$\frac{dw}{de} = \frac{1}{2b}.$$

The result of differentiating utility per person plus welfare per animal,  $U + w$ , with respect to  $e$  is

$$\frac{d(U + w)}{de} = \frac{e(e^2 + 4b(c - a))}{32b^2d} + \frac{1}{2b}.$$

The derivative of the number of animals killed  $q$  with respect to  $e$  is

$$\frac{dq}{de} = \frac{e}{4bd}.$$

Differentiating total welfare,  $wq$ , across animals with respect to  $e$  yields

$$\frac{d(wq)}{de} = \frac{3e^2 + 4b(c - a)}{16b^2d}.$$

Frank (2006) notes that increasing sensitivity to welfare conditions may have an ambiguous effect on utility. One of the mechanisms he highlights is that people's awareness of poor conditions may reduce their utility from consumption of a good, and restoring the initial utility from consumption by purchasing a good with better welfare conditions is costly, so that utility from alternative uses of the money is lost. Thus, utility may be reduced by better information about welfare. A similar argument is given in Bennett's (1995) model, where increased awareness of products made with higher animal welfare raises the disutility associated with consumption of a good produced with lower welfare. However, Frank (2006) argues that these results rest on the normative use of a limited information set as a means to define a socially beneficial outcome for optimisation. He rejects the use on the grounds of its arbitrariness, impracticality, and limited definition of agent interest.

In our model, increased sensitivity to welfare issues is an opportunity for people to gain more utility by buying goods with higher welfare standards. Frank (2006) notes this possibility by observing that people may get a "warm glow" from switching behaviour. Our model can derive the same results as Frank (2006) if we reduce utility by a large enough constant at the same time as we increase sensitivity to the welfare variable, so that buying higher welfare goods reduces utility loss rather than increasing utility relative to the starting level. We shall see in the next subsection that a reduction in consumption utility is associated with a decline in the quantity sold while leaving welfare unchanged. The reduction in consumption utility coupled with an increased sensitivity to welfare would represent a campaign in which consumers

are told that low welfare is bad, rather than high welfare is good. Such a campaign may appeal to both animal welfare and animal rights advocates.

#### 4.2 *Strict boycott*

Sometimes advocacy groups represent a product or services as inherently bad, rather than bad primarily as a result of welfare practices that can be reformed. The groups then urge a total boycott of the product. Boycotts have been urged in products and services including meat and animal products used as food (Vegan Society, 2014; Animal Aid, 2014), circuses using animals (Animal Defenders International, 2014), animal experimentation (British Union for the Abolition of Vivisection, 2014), and fur (Coalition to Abolish the Fur Trade, 2014).

We consider a campaign type that portrays a product as malign and urges a boycott. The campaign's effect is modelled as a reduction in the parameter  $c$  in the consumer utility function, which represents the linear component of utility derived from consumption. Differentiation of profits  $\Pi$  with respect to minus  $c$  gives

$$\frac{d\Pi}{d(-c)} = -\frac{e^2 + 4b(c - a)}{8bd}$$

The derivatives of the remaining ethically relevant quantities are

$$\frac{dU}{d(-c)} = -\frac{e^2 + 4b(c - a)}{16bd},$$

$$\frac{dw}{d(-c)} = 0,$$

$$\frac{d(U + w)}{d(-c)} = -\frac{e^2 + 4b(c - a)}{16bd},$$

$$\frac{dq}{d(-c)} = -\frac{1}{2d},$$

and

$$\frac{d(wq)}{d(-c)} = -\frac{e}{4bd}.$$

#### *4.3 New technology with higher welfare*

Campaigns by advocacy groups may attempt to promote new technology with higher welfare standards than presently employed in an industry. The campaigns may support the introduction of technologies that improve the welfare of animals currently used in production rather than replacing them entirely, for instance by providing information about the technology and reducing company uncertainty about its viability. As an example, the Humane Society of the United States (2011) provided a review of research literature on the economics of gestation crates and alternative systems of pig housing. Their technical information argues for the suitability and financial viability of the alternative systems. Campaigns for controlled atmosphere killing of chickens in replacement for mechanical neck cutting (People for the Ethical Treatment of Animals, 2014) are another example.

Our next campaign type tries to develop or introduce technology that increases welfare for animals without replacing them in the production process. Such campaigns act to make adoption easier, by reducing the cost or perceived cost of adopting the technology. The effect of the campaigns is represented by a reduction in the welfare cost variable  $b$ .

The derivatives of the ethically relevant quantities are

$$\frac{d\Pi}{d(-b)} = \frac{e^2(e^2 + 4b(c - a))}{32b^3d},$$

$$\frac{dU}{d(-b)} = \frac{e^2(e^2 + 4b(c - a))}{64b^3d},$$

$$\frac{dw}{d(-b)} = \frac{e}{2b^2},$$

$$\frac{d(U + w)}{d(-b)} = \frac{e^2(e^2 + 4b(c - a))}{64b^3d} + \frac{e}{2b^2},$$

$$\frac{dq}{d(-b)} = \frac{e^2}{8b^2d},$$

and



$$\frac{d(wq)}{d(-b)} = \frac{e(e^2 + 2b(c - a))}{8b^3d}.$$

#### *4.4 Negotiation on practices*

Advocacy groups may reach an agreement with a company to improve the welfare standard used in production. Examples include the PETA agreement with Wendy's (People for the Ethical Treatment of Animals, 2014a) and the PETA and the Humane Society of the United States agreement with Burger King (New York Times, 2007). Negotiation may be backed up with other forms of influence such as boycotts, but after the negotiations are concluded and permanent welfare reform is agreed, the other forms generally stop.

Our fourth campaign type involves negotiations between the advocacy group and the company, resulting in an increase in welfare above the free market level. The effect of the campaign is modelled by fixing welfare at an exogenous level above the free market rate of  $w = e/2b$ .  $w$  is no longer determined endogenously, so we have to revise the pricing calculation.

From equation 5, the profits are

$$\Pi = (p - a - bw^2)(c + ew - p)/d.$$

Instead of optimising over welfare  $w$  and price  $p$ , the company agrees  $w$  exogenously and then decides on  $p$  to maximise profits. By quadratic optimisation, the maximising solution in  $p$  and the ethically relevant variables are

$$p = \frac{bw^2 + ew + c + a}{2},$$

$$\Pi = \frac{(bw^2 - ew - c + a)^2}{4d}, \quad (7)$$

$$U = M + \frac{(bw^2 - ew - c + a)^2}{8d},$$

$$w = w,$$

$$U + w = M + \frac{(bw^2 - ew - c + a)^2}{8d} + w,$$

$$q = \frac{c - a - bw^2 + ew}{2d},$$

and

$$wq = \frac{w(c - a - bw^2 + ew)}{2d}.$$

For a non-negative quantity, the value of  $w$  must be less than the second root of the equation  $c - a - bw^2 + ew = 0$ , or

$$w < \frac{\sqrt{e^2 + 4b(c-a)} + e}{2b}. \quad (8)$$

We can see the effect of the campaign by differentiation of profits  $\Pi$  with respect to  $w$ , which gives

$$\frac{d\Pi}{dw} = \frac{(2bw - e)(bw^2 - ew - c + a)}{2d}$$

Since  $w > e/2b$ , the first bracket is positive. At  $w = e/2b$  the second bracket is  $-\frac{e^2}{4b} - c + a$  which is negative since  $-\frac{e^2}{4b} < 0$  and  $c > a$ . Thus, profits decline as welfare increases from  $w = e/2b$ . The rate of growth remains negative, since the value of the second bracket is negative over values of  $w$  that have a non-negative quantity sold. Thus, the campaign always reduces profits.

The derivative of utility per person  $U$  with respect to  $w$  is

$$\frac{dU}{dw} = \frac{(2bw - e)(bw^2 - ew - c + a)}{4d}.$$

Welfare  $w$  is differentiated with respect to  $w$  giving unity:

$$\frac{dw}{dw} = 1.$$

Differentiating utility per person plus welfare per animal,  $U + w$ , with respect to  $w$ , we have

$$\frac{d(U + w)}{dw} = \frac{(2bw - e)(bw^2 - ew - c + a)}{4d} + 1.$$

The sign is ambiguous, depending on whether the first additive term on the right hand side is greater or less than minus one.

The derivative of the number of animals killed  $q$  with respect to  $w$  is

$$\frac{dq}{dw} = \frac{-2bw + e}{2d},$$

while the derivative of total welfare,  $wq$ , across animals with respect to  $w$  is

$$\frac{d(wq)}{dw} = \frac{c - a - 3bw^2 + 2ew}{2d}.$$

At  $w = e/2b$  the derivative is

$$\frac{e^2 + 4b(c - a)}{8bd} > 0$$

so that total welfare initially rises as  $w$  increases beyond  $e/2b$ . The derivative

becomes negative when  $w > \frac{\sqrt{e^2 + 3b(c - a)} + e}{3b}$ . Given the restriction on  $w$  given by

equation 8 to ensure a positive quantity, the region of  $w$  with total welfare declining as  $w$  increases is where

$$\frac{\sqrt{e^2 + 4b(c - a)} + e}{2b} > w > \frac{\sqrt{e^2 + 3b(c - a)} + e}{3b},$$

which is non-empty since in the inequality

$$\frac{\sqrt{e^2 + 4b(c - a)}}{2b} + \frac{e}{2b} > \frac{\sqrt{e^2 + 3b(c - a)}}{3b} + \frac{e}{3b},$$

the terms on the left hand side exceed the corresponding terms on the right hand side.

Thus, total welfare initially increases and then declines as welfare increases.

#### *4.5 Praise for reform*

Advocacy groups sometimes praise companies for introducing welfare reforms. The praise can be perfunctory, or more substantial and include the right to use certification provided by the advocacy group. Such certifications include CIWF's Good Farm Animal Welfare Awards, the American Humane Association's Humane Heartland, and the RSPCA's Freedom Food. The certifications offer the company the chance to attract new consumers who would otherwise be reluctant to consume the good.

We examine the effect of a campaign in which an advocacy group offers a company a valuable commendation in exchange for increasing their animal welfare standards. The campaign is modelled as an exogenous increase in the welfare parameter  $w$  as in section 4.4 and a simultaneous increase in the parameter  $c$  measuring utility of

consuming the good, so that total profits are left unchanged at a constant  $F$ . From equation 7, profits are

$$\frac{(bw^2 - ew - c + a)^2}{4d} = F$$

For any welfare level  $w$ , the solution in  $c$  is

$$c = 2\sqrt{dF} + bw^2 - ew + a$$

where we exclude the second solution as the implied quantity sold is negative.

The maximising solution in  $p$  and the ethically relevant variables are

$$p = \sqrt{dF} + bw^2 + a,$$

$$\Pi = F,$$

$$U = M + \frac{F}{2},$$

$$w = w,$$

$$U + w = M + \frac{F}{2} + w,$$

$$q = \sqrt{\frac{F}{d}},$$

and

$$wq = w\sqrt{\frac{F}{d}}.$$

Utility and quantity are independent of welfare, conditional on the profits, as can be seen from the corresponding equations in section 4.4.

It follows that the derivatives of the ethically relevant quantities are

$$\frac{d\Pi}{dw} = 0,$$

$$\frac{dU}{dw} = 0,$$

$$\frac{dw}{dw} = 1,$$

$$\frac{d(U + w)}{dw} = 1,$$

$$\frac{dq}{dw} = 0,$$

and

$$\frac{d(wq)}{dw} = \sqrt{\frac{F}{d}}.$$

#### *4.6 Targeted direct action against low welfare*

Some campaigns take the form of direct action against a company whose welfare levels are considered too low by the advocacy group. The actions may consist of property damage, blockades, disruption, and intimidation. An example of such a campaign is from the Stop Huntingdon Animal Cruelty (SHAC) action against the animal testing company Huntingdon Life Sciences (HLS). Although SHAC is plausibly mainly driven by dislike of the general nature of HLS's work, their website (Stop Huntingdon Animal Cruelty, 2014) explicitly mentions welfare abuses and legal violations, and pesticide and household product testing, so we regard the severity of their campaign as partially motivated by perceived low welfare standards at HLS.

We model a campaign in which direct action causes damage or disruption to the company in proportion to the gap between the actual welfare and the level deemed minimally acceptable by the advocacy group, and so increases costs for the company in proportion to the gap. The campaign's effect is represented as an increased cost per unit of  $\max(W - w, 0)$ , where  $W$  is the group's minimally acceptable welfare.  $W$  is no less than the market value of  $w$ , so  $W \geq e/(2b)$ . Thus, the unit cost of production is  $a + bw^2 + \max(W - w, 0)$ .

The problem solved by the company is to maximise the profit function of



$$\Pi = (p - a - bw^2 - \max(W - w, 0))(c + ew - p) / d$$

For  $w > W$ , the profit function becomes

$$\Pi = (p - a - bw^2)(c + ew - p) / d$$

and since  $w > W \geq e/(2b)$  which is the market value of welfare, it is optimal to reduce  $w$  to  $W$  or lower. If  $w \leq W$  then the profit function is

$$\Pi = (p - a - bw^2 - W + w)(c + ew - p) / d \quad (9)$$

which has a welfare solution of

$$w = \frac{e+1}{2b}.$$

If  $W \leq \frac{e+1}{2b}$ , the solution is  $w = W$ . Thus, we can distinguish two cases:  $W \leq \frac{e+1}{2b}$

and  $W > \frac{e+1}{2b}$ . In the first case, the advocacy group makes limited welfare demands

on the company, and the company solves

$$\Pi = (p - a - bW^2)(c + eW - p) / d.$$

The problem is then the same as for negotiation on practices in section 4.4 with  $w$  replaced by  $W$ , with the same solutions. In the second case, the advocacy group's welfare demands are larger, and the company maximises profits from equation 9, with solution

$$p = \frac{3e^2 + 2e - 1 + 4b(c + a + W)}{8b}$$

and

$$w = \frac{e + 1}{2b}.$$

Animal welfare therefore increases. Profits are

$$\Pi = \frac{((e + 1)^2 + 4b(c - a - W))^2}{64b^2d}. \quad (10)$$

Consumer utility is

$$U = M + \frac{((e + 1)^2 + 4b(c - a - W))^2}{128b^2d}.$$

The sum of utility and welfare is

$$U + w = M + \frac{((e + 1)^2 + 4b(c - a - W))^2}{128b^2d} + \frac{e + 1}{2b}.$$

The number of animals killed is

$$q = \frac{(e+1)^2 + 4b(c-a-W)}{8bd}.$$

Since  $W > \frac{e+1}{2b}$ , we have

$$q < \frac{(e+1)^2 + 4b(c-a-(e+1)/(2b))}{8bd}$$

or

$$q < \frac{e^2 - 1 + 4b(c-a)}{8bd} \tag{11}$$

which is less than the number of animals killed in the absence of the campaign,

$\frac{e^2 + 4b(c-a)}{8bd}$  (from equation 6). It follows that the campaign reduces the number

of animals killed.

Total welfare is

$$wq = \frac{(e+1)((e+1)^2 + 4b(c-a-W))}{16b^2d}$$

which can be made arbitrarily small for large enough  $W$ , so the change in total welfare would then be negative.

When  $W = \frac{e+1}{2b}$ , the change in  $wq$  is

$$\frac{(e+1)(e^2 - 1 + 4b(c-a))}{16b^2d} - \frac{e(e^2 + 4b(c-a))}{16b^2d}$$

or

$$\frac{e^2 - e - 1 + 4b(c-a)}{16b^2d}.$$

For large  $e$  this quantity is positive, and the welfare change is positive. As  $W$  can be made arbitrarily close to  $(e+1)/(2b)$ , we find that the change in total welfare depends on market and campaign parameters, and has an ambiguous sign.

To ensure a non-negative quantity sold,  $\frac{e^2 - 1 + 4b(c-a)}{8bd} > 0$ . Then from equation

10 and using  $W > \frac{e+1}{2b}$  we have

$$\Pi < \frac{((e+1)^2 + 4b(c-a - (e+1)/(2b)))^2}{64b^2d}$$

or

$$\Pi < \frac{(e^2 - 1 + 4b(c - a))^2}{64b^2d}$$

which is less than  $\frac{(e^2 + 4b(c - a))^2}{64b^2d}$  since from equation (11) we have

$$\frac{e^2 - 1 + 4b(c - a)}{8bd} > 0. \text{ Thus, the campaign results in a decline in corporate profits.}$$

Similarly, we deduce that the campaign reduces consumer utility.

The change in the sum of welfare plus utility is

$$M + \frac{((e + 1)^2 + 4b(c - a - W))^2}{128b^2d} + \frac{e + 1}{2b} - M - \frac{(e^2 + 4b(c - a))^2}{128b^2d} - \frac{e}{2b}$$

or

$$\frac{((e + 1)^2 + 4b(c - a - W))^2 - (e^2 + 4b(c - a))^2}{128b^2d} + \frac{1}{2b}.$$

The first term (the change in utility) is negative, and its absolute magnitude can be made as small or as large as required by varying the parameter  $d$ . The second term is positive and independent of  $d$ . Thus, the effect of the campaign on the sum of utility and welfare is ambiguous.

#### 4.7 General direct action against the company

Advocacy groups may engage in direct action because of the nature of the good or service produced, rather than because of the specific welfare standards in production. An example of such a campaign is the smashing of an organic butcher's windows described by the Animal Liberation Front Press Office (2014), with an activist stating that the target was chosen because it sells meat, irrespective of its welfare standards.

The seventh campaign type we consider consists of direct action against a company, independent of the welfare standards it has. It is modelled by an increase in the cost of production parameter  $a$ . We can see the effect of the campaign by differentiation of the ethically relevant quantities:

$$\frac{d\Pi}{da} = -\frac{e^2 + 4b(c - a)}{8bd},$$

$$\frac{dU}{da} = -\frac{e^2 + 4b(c - a)}{16bd},$$

$$\frac{dw}{da} = 0,$$

$$\frac{d(U + w)}{da} = -\frac{e^2 + 4b(c - a)}{16bd},$$

$$\frac{dq}{da} = -\frac{1}{2d},$$

and

$$\frac{d(wq)}{da} = -\frac{e}{4bd}.$$

Inspecting the solutions here and comparing them with those in section 4.2, we see that the market outcomes of general direct action are the same as for a boycott. The reason is that in our monopolistic market model, the changes in the utility parameter  $c$  and the cost parameter  $a$  are equal and opposite in their effect on market outcomes, as we can see from the outcome equations in section 3.2.

#### *4.8 Summary of campaign preferences*

Table 1 summarises our findings of how the different ethical positions benefit or lose from each campaign. The campaign aimed at raising consumer awareness issues is favoured by all ethical positions except animal rights. The reason is that the campaign as it is framed makes animal welfare an additional consumer benefit that can be acquired by buying the product in a form with higher welfare standards. So the product can be more attractive than before. The company sells the higher welfare product, and so sales, utility, and profits increase.

The boycott campaign causes losses from four of the perspectives, namely company interests, consumer interests, public concern, and logic of the larder. The product becomes less attractive, so consumers derive less benefit from buying it, and sales and profits reduce. As the campaign targets any animal usage regardless of the intensity of welfare standards, the company does not adjust the welfare of animals used. The reduction in animals killed is appealing from an animal rights position.

**Table 1: The benefits or losses from campaigns, viewed from different ethical positions**

Ethical basis	Campaign						
	Consumer oriented		Tech.	Collaborative		Direct action	
	Consumer awareness	Boycott	Welfare tech.	Negotiation	Reform praise	Targeted action	General action
Company interests	+	-	+	-	0	-	-
Consumer interests	+	-	+	-	0	-	-
Animal welfare	+	0	+	+	+	+	0
Public concern	+	-	+	?	+	?	-
Animal rights	-	+	-	+	0	+	+
Logic of the larder	+	-	+	?	+	?	-

Notes: + means a benefit is perceived. – means a loss is perceived. 0 means neither a benefit or loss is perceived. ? means the perception of the outcome depends on market conditions.

The campaign to promote the use of higher welfare technology is viewed positively from all ethical positions except animal rights. The campaign makes products with higher welfare more affordable, and it is optimal for the company to bring higher welfare goods to market. Profits and utility increase, as does the quantity of animals killed.



The campaign of negotiation of higher welfare brings losses to the ethical positions of company interests and consumer interests. The campaign increases welfare above the profit maximising level. With the pricing choices of the company, the consumer utility also falls and so does the quantity sold. Because of the welfare increase and quantity decline, the campaign brings benefits in the ethical positions of animal welfare and animal rights but may bring benefits or losses from the logic of the larder position depending on market conditions. From the viewpoint of public concern, the outcomes are again ambiguous.

The campaign of praising a company that introduces welfare reforms is viewed neutrally by the company interests and consumer interests viewpoints. The campaign is designed to be neutral with respect to profits, and so leaves consumer utility unchanged. The campaign increases welfare and is viewed favourably from animal welfare and public concern positions. Under monopoly pricing, changes in the exogenous welfare and linear component of consumer utility leave the quantities of animals killed unchanged, conditional on the profits. Thus, the campaign is neutral from an animal rights perspective as well. The logic of the larder position views the campaign positively because of the welfare increase and constant number of animals killed.

The campaign of targeted action against low welfare standards causes losses in the company interests and consumer interests ethical positions. The campaign reduces the value and utility of any sale, with the company able to offset the declines only partially by increasing welfare. An animal welfare position evaluates the campaign positively. The changes are associated with reduced numbers of animals killed, so the

campaign is also evaluated positively by the animal rights position. For the public concern and logic of the larger positions, the offsetting movements of their constituent elements make their evaluation of the campaign ambiguous.

The campaign of general direct action against the company is viewed negatively from company interests and consumer interests ethical positions. Costs increase, reducing profits and utility. The campaign is neutral from an animal welfare position. Because the severity of the campaign is not mitigated by raising welfare standards, no welfare changes occur. From an animal rights viewpoint, the decline in the number of animals killed means the campaign is considered beneficial. The public concern and logic of the larger positions view the campaign negatively.

## **5. Conclusion**

This paper suggests a number of campaign strategies allowing advocates to simultaneously work towards welfare and rights goals when dealing with a monopolistic supplier. Firstly, both negotiation and targeted direct action can offer welfare and rights gains. However, consumers may be hostile to the changes, leading to potentially temporary gains unless a secondary campaign is launched to influence public opinion. Secondly, a campaign that says low welfare standards are bad and a campaign that says high welfare standards are good can both increase welfare, but only the former decreases total animal use. Thirdly, direct action campaigns that target companies can achieve welfare gains as well as reducing animal use if campaign intensity partially reduces when welfare standards rise. The campaigns would then also attract more support from beyond animal advocates.

There are a number of assumption changes or extensions that could be made to increase understanding of the impact of campaigns. The representative consumer model could be given fuller foundations based on consumer heterogeneity in valuations of both welfare and non-welfare characteristics of the good. As we noted in the main text, we did not do so here because the resulting optimisation problem faced by the company did not give compact algebraic solutions. Numerical techniques may be required to determine outcomes.

Another extension relates to the introduction of government. In our model, campaigns act through directly changing market outcomes. The government sector could be introduced to allow for lobbying (as in Heyes and Liston-Heyes' (2005) analysis of the organisation of environmental lobbying) or taxes and subsidies (see Cowen (2006)). The analysis could remain economic under a public choice or law and economics approach.

We analysed a limited range of campaigns, and other campaigns could be examined in future work. These could be variants on the ones studied here, or entirely novel ones. A potentially informative departure could be how institutional arrangements affect market outcomes, such as whether animals are treated as property (Francione, 1996).

The model assumes that the company is monopolistic. An alternative would be to assume a competitive market where price is set equal to cost, so that  $p = a + bw^2$ . The price can be substituted in the expression for utility given by equation 4, and the welfare solved to maximise utility. The solution in  $w$  is independent of  $q$ , and is  $w = e/(2b)$ , as in the monopolistic case. Consequently  $p = a + e^2/(4b)$ . There are

some differences in the resulting algebraic expressions for the ethically relevant quantities, but the resulting qualitative support or opposition to each campaign is broadly the same as for the monopoly, as described in table one. The only differences are that profits are identically zero so the company interest position is indifferent to all campaigns, and campaigners can't praise reform so as to leave profits unchanged because profits are held at zero anyway.

The paper indicates that all the ethical positions have a choice of campaigns to achieve their aims. A development that may be helpful to advocacy groups would be to determine their optimal portfolio of campaigns. One element of such an analysis would be the extent of output response to changes in input variables, which we have already stated in algebraic terms. Parameters could be replaced with their values estimated from econometric studies to give actual market responses. Other elements of an optimal portfolio analysis would be the extent of response of input variables to advocacy group activity, and budgeting. There is precedent for analysis of optimal welfare choices (from a company perspective of increasing profitability) in Ahmadi et al (2011).

We have not modelled how companies may respond to campaigns beyond adjustment of price and welfare levels. In practice, targets in advocacy campaigns may respond by attempting to adjust other characteristics of the market such as market demand (Jasper and Poulsen, 1993). The optimal sequence of responses and counter-responses could be analysed in future work, perhaps in a game theoretic setting. The different welfare valuations of the various ethical positions would then correspond to different games being played, with possibly clashing strategies and equilibria.

## Appendix

Table A1: Definitions of the model variables

Variable	Definition
w	The welfare of each animal used in production of a good
q	The quantity of the good consumed by a representative consumer
a	The cost, per unit of the good produced, of all non-welfare inputs of production
b	The increase in cost per unit of the good when $w^2$ increases by one unit
G	The quantity consumed of a basket of other goods
U	The utility of the consumer
c	The marginal increase in consumer utility from an extra unit of consumption of the good when welfare and consumption are both zero
d	The reduction in the additional marginal utility from each extra unit of consumption of the good
e	The increase in consumer utility, per unit of the good consumed, when welfare rises by one unit
M	The consumer's budget
p	The price of the good
$\Pi$	The company's profit
x	$x = ew - p$ , a transformation used in solving the model
F	The value at which profits are fixed when reform leaves them unchanged

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